January/February 1989 Vol. XIV Nos. 1–2

ENDANGERED SPECIES

Technical Bulletin

Department of the Interior, U.S. Fish and Wildlife Service, Washington, D.C. 20240

Pesticides and Endangered Species: New Approaches to Evaluating Impacts

Larry Thomas
Division of Endangered Species and Habitat Conservation
Washington, D.C.

It is becoming increasingly apparent that pesticides can have a significant impact on some plant and animal populations. For example, an analysis by the Environmental Protection Agency (EPA) of recent pesticide studies (EPA 1989) and mortality rates from field studies (Balcomb et al. 1984) estimated that 1-2 million bird deaths per year result from the use of carbofuran alone. Further, a review of the Fish and Wildlife Service's Endangered Species Information System (ESIS) database in 1988 for 313 of the Endangered and Threatened species listed in the United States shows that 52 were listed, in part, because of herbicide use and that 61 species were listed, in part, because of pesticide use in general (Halvorson 1988). Impacts from pesticides, including herbicides and insecticides, are 2 of 63 kinds of reasons given in the ESIS database as causes for listing species as Endangered and Threatened. Notable examples of species negatively impacted by pesticides include the bald eagle (*Haliaeetus leucocephalus*), peregrine falcon (*Falco peregrinus*), brown pelican (*Pelecanus occidentalis*), and Wyoming toad (*Bufo hemiophrys baxteri*).

The EPA is responsible for evaluating pesticides and registering them for use. Any appropriate use limitations are included on the product labeling. Since it is a Federal agency, the EPA is required to conduct these activities in compliance with Section 7 of the Endangered Species Act, as amended. Section 7 states, in part, that every Federal agency "... shall, in consultation with and with the assistance of the Secretary, insure that any action authorized, funded, or carried out by such agency ... is not likely to jeopardize the continued existence of any endangered or threatened species ... " or adversely its critical habitat. When an agency determines that one of its proposed actions may affect a listed species, it is required to consult with the Fish and Wildlife Service. The Service then issues a "biological opinion." If the biological opinion finds that the proposed action is likely to jeopardize the survival of a listed species or adversely modify its critical habitat, the Service attempts to identify "reasonable and prudent" alternatives that would avoid such impacts.

In 1982, the Endangered Species Act was amended to authorize permits in certain cases for the "taking" of listed species incidental to a proposed action, provided such incidental taking is not at a level that jeopardizes the survival of the species. If such taking is anticipated, the 1982 amendment requires that the biological opinion contain an "incidental take statement" that specifies the anticipated amount or extent of incidental take and provides "reasonable and prudent measures," with implementing terms and conditions, for minimizing the take. Additional instructions describing monitoring and reporting requirements if taking occurs are to be included in the statements.

Between 1977 and 1982, the EPA conducted over 2,500 pesticide registration actions. It requested formal Section 7 consultation with the Service on 56 of these actions, resulting in 36 jeopardy biological opinions. By 1982, it was recognized that a great deal of time would be required to adequately ensure that pesticide registration actions would not jeopardize listed species. In an attempt to remedy this and other problems, a new approach to the consultation process was initiated: groups or "clusters" of chemicals were selected for review based on their registered use patterns (e.g., chemicals used to grow corn). This approach was intended to give a comprehensive, consistent review of all pesticides with common use patterns. It was also intended to provide labeling consistency, which would reduce economic impacts caused by the selective labeling associated with individual registration reviews.

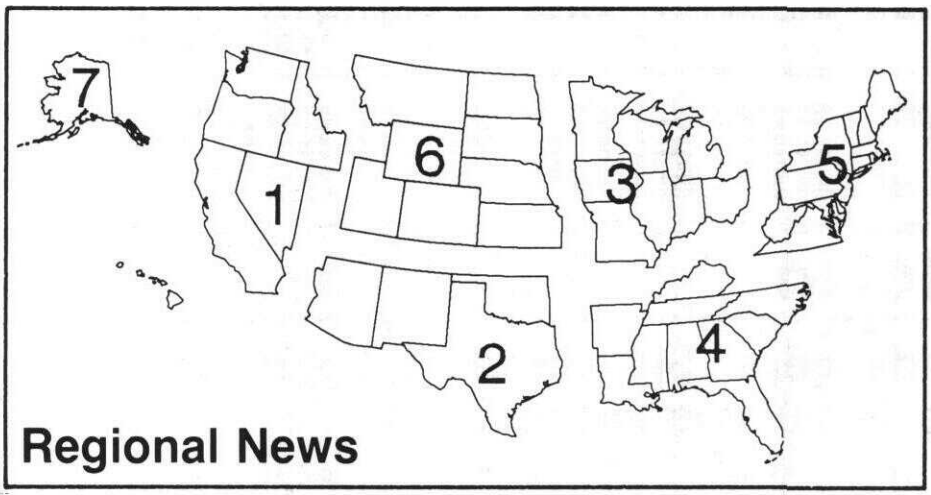
In 1983 and 1984, five "cluster consultations" were conducted in which 180 active ingredients were reviewed. These cluster consultations resulted in 305 findings where listed species could be jeopardized. As required by the Endangered Species Act, the biological opinions included reasonable and prudent alternatives to avoid jeopardizing the species or adversely modifying its critical habitat. In some cases, the alternatives were prohibitions on the use of the pesticide in the habitat occupied by the species. These areas of occupied habitat were to be identified by the Service. After these biological opinions were formulated, it became the responsibility of the EPA to implement the reasonable and prudent alternatives.

In 1986, the Center for Environmental Education issued a report, *The Environmental Protection Agency's Implementation of the Endangered Species Act with Respect to Pesticide Registration*, which was prepared for the President's Council on Environmental Quality. The report was critical of the EPA for not implementing reasonable and prudent alternatives identified in the Service's biological opinions. It concluded that neither the case-by-case nor the cluster approach alone offered a consultation mechanism that was both detailed and expeditious. The report recommended that a combination of the two approaches be adopted and that a pesticide that exceeds a trigger in the cluster analysis be reviewed in a single case study to identify problems involving other uses of the pesticide. It also recommended that immediate steps be taken to implement reasonable and prudent alternatives identified in existing jeopardy opinions.

In late 1986, the EPA initiated an accelerated effort to complete its Endangered Species Protection Program. A key facet of this effort called for maps detailing occupied habitat for a select group of listed species, combined with bulletins that would establish certain limitations for pesticide use in these areas. Unfortunately, in an attempt to make the maps more understandable, some were expanded far beyond the borders of occupied habitat. For example, proposed boundaries for restricted use areas were extended to the nearest highway or other recognizable feature, occasionally including hundreds of acres that were not intended to be identified as occupied habitat.

A number of pesticide user groups responded to the proposed maps and the EPA's plan to implement its Endangered Species Protection Program. Unfortunately, much of the information was misinterpreted. In part because of the user groups' concerns, Congress ex-

(continued on page 7)



Regional News

Regional endangered species staffers have reported the following recent news:

Region 1 — Recovery activities continue for the Threatened Paiute cutthroat trout (*Salmo clarki seleniris*) in the Toiyabe National Forest, California. Activities completed in 1988 include: (1) the installation of several instream structures to improve rearing habitat, (2) the enhancement of a barrier on Fourmile Creek to minimize upstream migration of competing trout species, (3) the installation of erosion control structures along several river bends to reduce bank sloughing and promote natural revegetation, (4) recontouring a deeply incised intermittent tributary to reduce sedimentation in Silver King Creek, and (5) maintenance of the solar-powered electric fences that were installed to exclude cattle and thereby promote willow regrowth in the riparian corridor. For the third straight year, volunteers from Trout Unlimited assisted in this habitat restoration project, contributing over 1100 hours of labor.

* * *

The Fish and Wildlife Service's Sacramento, California, Enhancement Field Station concluded a 3-year monitoring program for the Army Corps of Engineers to evaluate an experimental bank protection method. Known as the "palisades method," it consists of nylon webbing placed in a river channel perpendicular to the bank. The webbing traps debris and silt in a manner that stops bank erosion. The Service has been concerned for years that traditional methods of using rock rip-rap to stabilize banks have destroyed fishery habitat values, particularly juvenile salmon rearing habitat, and the elderberry plants needed by the Threatened valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*). The concluding report indicates that the "palisades method" is environmentally superior to rock revetment.

* * *

Region 2 — By February 1, 137 whooping cranes (*Grus americana*) had arrived at Aransas National Wildlife Refuge on the Texas Gulf Coast. One other had stopped about 50 miles north of the refuge, for a total of 138 whoopers that are known to have arrived in Texas.

In the Rocky Mountain cross-fostered whooper population, 13 birds were confirmed wintering in New Mexico and one or two reportedly were seen in the State of Chihuahua, Mexico. Neither of the two birds that fledged at Gray's Lake National Wildlife Refuge last summer have been seen since they left the refuge.

* * *

On January 3, 1989, two hunters were hunting waterfowl near San Jose Island, a

(continued on page 13)

U.S. Fish and Wildlife Service
Washington, D.C. 20240

Frank Dunkle, *Director*
(202-343-4717)
Ralph O. Morgenweck
Assistant Director for Fish and Wildlife Enhancement
(202-343-4646)
William E. Knapp, *Chief,*
Kenneth B. Stansell, *Deputy Chief,*
Division of Endangered Species and Habitat Conservation
(703-358-2161)
Marshal P. Jones, *Chief,*
Office of Management Authority
(202-343-4968)
Clark R. Bavin, *Chief,*
Division of Law Enforcement
(202-343-9242)

TECHNICAL BULLETIN
Michael Bender, *Editor*
(703-358-2166)

Regional Offices

Region 1, Lloyd 500 Bldg., Suite 1692, 500 N.E. Multnomah St., Portland, OR 97232 (503-231-6118); Marvin Plenert, *Regional Director;* Robert P. Smith, *Assistant Regional Director;* Jay Watson, *Chief, Division of Endangered Species and Habitat Conservation.*

Region 2, P.O. Box 1306, Albuquerque, NM 87103 (505-766-2321); Michael J. Spear, *Regional Director;* James A. Young, *Assistant Regional Director;* Steve Chambers, *Endangered Species Specialist.*

Region 3, Federal Bldg., Fort Snelling, Twin Cities, MN 55111 (612-725-3500); James C. Gritman, *Regional Director;* Gerald R. Lowry, *Assistant Regional Director;* James M. Engel, *Endangered Species Specialist.*

Region 4, Richard B. Russell Federal Bldg., 75 Spring St., S.W., Atlanta, GA 30303 (404-331-3580); James W. Pulliam, *Regional Director;* John I. Christian, *Deputy Assistant Regional Director;* David Fleming, *Endangered Species Specialist.*

Region 5, One Gateway Center, Suite 700, Newton Corner, MA 02158 (617-965-5100); Ronald E. Lambertson, *Regional Director;* Ralph Pisapia, *Assistant Regional Director;* Paul Nickerson, *Endangered Species Specialist.*

Region 6, P.O. Box 25486, Denver Federal Center; Denver, CO 80225 (303-236-7920); Galen Buterbaugh, *Regional Director;* Robert E. Jacobsen, *Assistant Regional Director;* Larry Shanks, *Endangered Species Specialist.*

Region 7, 1011 E. Tudor Rd., Anchorage, AK 99503 (907-786-3542); Walter O. Stieglitz, *Regional Director;* Rowan Gould, *Assistant Regional Director;* Ron Garrett, *Endangered Species Specialist.*

Region 8 (FWS Research and Development nationwide), Washington, D.C. 20240; Richard N. Smith, *Regional Director;* Al Sherk, *Endangered Species Specialist (703-358-1710).*

U.S. Fish and Wildlife Service Regions

Region 1: California, Hawaii, Idaho, Nevada, Oregon, Washington, American Samoa, Commonwealth of the Northern Mariana Islands, Guam, and the Pacific Trust Territories. **Region 2:** Arizona, New Mexico, Oklahoma, and Texas. **Region 3:** Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, Ohio, and Wisconsin. **Region 4:** Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, Puerto Rico and the U.S. Virgin Islands. **Region 5:** Connecticut, Delaware, District of Columbia, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, Virginia and West Virginia. **Region 6:** Colorado, Kansas, Montana, Nebraska, North Dakota, South Dakota, Utah, and Wyoming. **Region 7:** Alaska. **Region 8:** Research and Development nationwide.

THE ENDANGERED SPECIES TECHNICAL BULLETIN is published monthly by the U.S. Fish and Wildlife Service, Department of the Interior, Washington, D.C. 20240.

Corrections

Due to a printer's error, a photo of the prairie fringed orchid on page 4 of BULLETIN Vol. XIII, No. 11-12, was printed upside down.

"Breakthough in Recovery of the Puerto Rican Plain Pigeon," a story in BULLETIN Vol. XIII, No. 9-10, should have been credited to Mary Conser of the U.S. Fish and Wildlife Service's Caribbean Field Office and Raul A. Perez-Rivera of the University of Puerto Rico at Humacao. We regret the error.

Red Wolf Recovery Effort Intensifies

Michael D. Rees
Division of Endangered Species and Habitat Conservation
Washington, D.C.

photo by Bob Campbell, South Carolina Wildlife and Marine Resources Department

captive red wolves at the Bulls Island captive breeding facility

The effort to recover the Endangered red wolf (*Canis rufus*) is expanding on a variety of fronts. In 1980, the species was extinct in the wild. As of February 1, 1989, there were a total of 84 red wolves, 45 of which were in the Fish and Wildlife Service/Point Defiance Zoo captive breeding project in Graham, Washington. The remaining wolves were in other captive breeding facilities, acclimation pens, and the wild. The Service is moving ahead to increase both the number of wolves in the wild and the number of facilities and island sites used to propagate wolves.

Eleven red wolves are being held in acclimation pens and four are free on Alligator River National Wildlife Refuge in eastern North Carolina, the first mainland site where the species has been released back into the wild (see BULLETIN Vol. XII, No. 11-12). Of the four pairs of captive-raised wolves released originally in September 1987, two females died from uterine infections, two males were killed by automobiles, one female had to be euthanized after being injured in a fight, and one male choked to death on part of a raccoon—a very unusual occurrence. (The Service's National Wildlife Health Research Center in Madison, Wisconsin, examined the wolf's tissues and discovered no abnormalities.) The remaining male and female were recaptured and placed temporarily back into the acclimation pens to be bred. Biologists have determined that the best way to propagate captive-raised red wolves is to breed them in acclimation pens.

In April 1988, two female wolves from Graham, Washington, were released on the refuge to replace the two females that had died in the wild. These females, however, failed to pair with the two adult males then free on the refuge. One female was recaptured a few months after being released when she started showing aberrant behavior. It turned out this wolf also had a serious uterine infection. The other female was recaptured in January, after having paired with the adult male that later died from choking. Both females are being bred in the acclimation pens on the refuge.

The four red wolves still free on the refuge are all pups. Two of these pups were born in the wild in separate litters. The other two were brought up from Bulls Island at Cape Romain National Wildlife Refuge, South Carolina, and released in December 1988. The two Bulls Island pups were born on the island in captivity, but had been in the wild there with their parents since July 8, 1988.

The wolves in the Alligator River Refuge acclimation pens should have pups in late April or early May of 1989. About 10 weeks after the pups are born, they will be surgically implanted with radio transmitters, a relatively simple operation, so biologists can track them when they are released. About a week later, assuming there are no problems, the doors to the pens will be opened and the wolves can leave. The recovery team plans to release three pairs of adult wolves and their pups from the acclimation pens into the refuge in early summer of 1989. The wolves will be released as family units into different parts of the refuge.

It is thought that the high mortality rate experienced by the captive-raised wolves when they are released into the wild is due at least in part to a lowered immunity to infection. After two or three generations in captivity, the animals may be faced with immune systems that cannot cope with various diseases encountered in the wild. To overcome this potential problem, the Service is trying to move away from releasing only captive-raised animals and focus more on using animals raised in the wild. This strategy entails releasing captive-born pups into the wild as soon as possible. The use of islands as propagation sites also shows much promise.

In November 1987, an adult male and female from Graham, Washington, were placed in an acclimation pen on Bulls Island. The pair had 4 pups, 2 of which died. In July 1988, the 2 adults and 2 pups were set free on the 5,000-acre island. In December, all of the animals were recaptured. The 2 pups, now wild, were sent up to Alligator River Refuge, while the adults were put back in their pen to breed again.

Another propagation island site was established on January 10, when a pair of adult wolves were placed in an acclimation pen on Horn Island, part of the Gulf Islands National Seashore administered by the National Park Service. The 3,500-acre island, part of the National Wilderness Preservation System, is 8 miles from the coast of Mississippi. After pups are born, the wolves will be free to roam the island for 8 to 9 months. Then the adults will be recaptured and bred again; the pups will be recaptured, moved to the Alligator River Refuge, and released.

The Service also is trying to increase the captive red wolf population in order to expand the species' gene pool. Some of these animals will be bred with wild wolves, but most will remain in captivity for their lifetime. Eight facilities are cooperating with the Service in its captive breeding project: Audubon Park, New Orleans; Alexandria Zoological Park, Alexandria, Louisiana; Texas Zoo, Victoria, Texas; Burnett Park Zoo, Liverpool, New York; Tallahassee Junior Museum, Tallahassee, Florida; Wild Canid Survival and Research Center, Eureka, Missouri; and the Los Angeles Zoo. The Fossil Rim Wildlife Center at Glen Rose, Texas, will be joining the program shortly, and a number of other facilities probably will be participating in the future. All of these cooperating facilities have agreed to breed red wolves and pay for their upkeep. In addition, the Service is continuing to fund the captive breeding effort in Graham, Washington, operated by the Point Defiance Zoo.

The Service is in the process of rewriting the Red Wolf Recovery Plan. A draft of the plan should be available for public comment in the spring of 1989. In addition, the Service is identifying new propagation islands. A potential new mainland release site also may be identified later this year. In the future, Alligator River Refuge will probably serve in part as a "half-way house": wild wolf pups from the propagation islands will be temporarily placed in the refuge and then translocated to other mainland release sites as they become available. Although the red wolf has a long way to go before it can be considered a recovered species, the future is beginning to look promising.

New Animal Notice of Review Published

James Tate, Jr.
Division of Endangered Species and
Habitat Conservation
Washington, D.C.

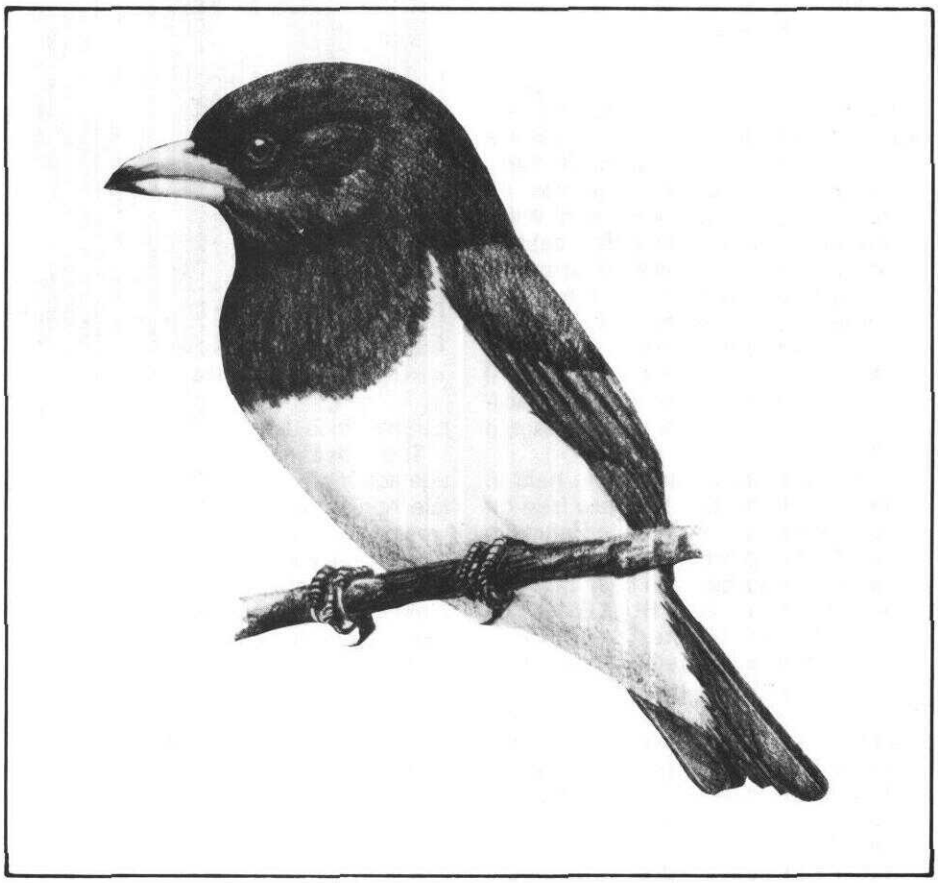
In May of 1984, the *Federal Register* carried a review of the invertebrate wildlife under consideration by the Fish and Wildlife Service for addition to the List of Endangered and Threatened Wildlife. Later, in September of 1985, the review of vertebrate wildlife was published. The two separate lists have now been updated, revised, and published jointly in the January 6, 1989, *Federal Register* as the Animal Notice of Review.

The new notice identifies those native U.S. animal taxa, invertebrates (sponges, hydroids, flatworms, earthworms, arthropods, and mollusks) and vertebrates (fishes, amphibians, reptiles, birds, and mammals), that are considered candidates for possible addition to the Federal List of Endangered and Threatened Wildlife. In addition, the animal notice identifies those taxa that were once being considered for listing but are not currently receiving such consideration. A separate notice of review is published periodically for plants.

The 1988 amendments to the Endangered Species Act (Act) allow the Service to spend money toward the recovery of species it has identified as candidates for listing as Endangered or Threatened. The potential for species conservation that can come from such pre-listing recovery actions is great. Identifying vulnerable species in a notice of review also allows other Federal agencies to consider the needs of these animals and plants during the planning of agency activities. Because setting up a mechanism for regular monitoring of vulnerable species was another goal of the 1988 amendments, the Service plans to publish a revised animal notice every other year. On alternate years, a notice of review for vulnerable plants can be expected.

Because a primary purpose of this new animal review notice is to provide lists of the species being considered as candidates for possible listing proposals, it is often referred to as the "candidate notice." The notice puts wildlife into one of several categories:

- Category 1 species—those for which the Service has enough information to support listing as soon as time and resources allow the developing and publishing of the requisite regulations in the *Federal Register*. (With current resources, the Service expects to be able to list about 50 species of animals and plants annually.)
- Category 2 species—those for which there is some evidence of vulnerability, but for which there are not enough data to support listing proposals until status reviews can be done to better determine the species' distributions, vulnerabilities, and threats to their survival.



drawing by H. Douglas Pratt, reprinted from *The Birds of Hawaii and the Tropical Pacific* with permission

The Palau white-breasted wood swallow* (Artamus leucorhynchus pelewensis) *is a category 1 listing candidate in the Caroline Islands, U.S. Trust Territories.

A strict constructionist could say that only the Category 1 species are true candidates for listing. More often, however, Category 2 species are combined with Category 1 species and generally referred to as "the candidates." This is because many of the Category 2 species will become Category 1 species after status reviews are completed on them. As new information becomes available, most Category 2 candidates probably will be proposed for listing, some of them even possibly prior to some of the current Category 1 species.

There remains a Category 3 to be considered as well. Category 3 is a compilation of those species that have been suggested at one time or another as possibly being in need of protection. It is subdivided into three parts:

- Category 3A—those species thought to be extinct.
- Category 3B—those found to be taxonomically invalid.
- Category 3C—those found to no longer be subject to substantial threats.

Species in Category 3A could be considered to be candidates for listing as well. This is because it is not always possible to know when a species becomes extinct, or even if it is extinct, just because it has not been seen for a while.

For example, the ivory-billed woodpecker (*Campephilus principalis*) in continental North America was declared extinct by various authorities many times in the last 50 years. Yet, as recently as April of 1988, a provocative sighting of a large woodpecker with distinguishing field marks of the ivory-bill was received. How will we know for sure if and when the last continental ivory-bill has died?

The problem of documenting extinction or survival can be even more difficult for plant species. The Rydberg milk-vetch (*Astragulus perianus*) was first collected in Utah in 1905. The specimens resided in a museum collection until 1964, when they were recognized as a species new to science. When the original collection location was revisited, the species could not be found. It was rediscovered elsewhere in 1976, and was listed in 1978 as Threatened with only two known populations.

(continued on next page)

Over the last 9 years, however, 10 additional populations have been discovered. Because the Rydberg milk-vetch is no longer considered to be in danger of extinction, it has been proposed for delisting. (See story in this edition of the BULLETIN.)

One hundred and nineteen U.S. species of animals are noted in the new notice of review as almost certainly extinct, but most of these were probably gone before passage of the Endangered Species Act in 1973. Two species that have been mentioned in the media as examples of animals that have gone extinct while Congress was considering reauthorization of the Endangered Species Act, the Texas Henslow's sparrow (*Ammodramus henslowii houstonensis*) and the Guam broadbill (*Myiagra freycineti*), present a similar problem. The Texas Henslow's sparrow was last reported in 1982, but was not recognized as a distinct subspecies until 1983; thus, it presumably was extinct by the time it had been described scientifically. In the case of the Guam broadbill, this bird was already undergoing a population decline in the late 1970s. To the best of our knowledge, it has not been seen since 1981. In any case, neither of these taxa became extinct while awaiting reauthorization of the Endangered Species Act.

To be thorough in the tally of all candidate species, those in Category 1 need to be added to those in Category 2 that we expect will be changed to Category 1 as a result of status surveys and to those in Category 3A that are now thought to be extinct but that we expect to be rediscovered. Because coming up with a firm estimate of such future changes would require the prescience of a fortune teller, it would appear that there is no such thing as a strictly quantifiable candidate list. Being practical, however, most of us use the totals of Categories 1 and 2 as a rough estimate of the number of candidate species that have to be reviewed and possibly listed.

photo by Paul Opler

The regal fritillary butterfly* (Speyeria idalia), *a category 2 candidate, is one of many butterflies and moths on the new animal notice of review.

photo by Merlin D. Tuttle, courtesy of Bat Conservation International

The Mariana flying fox* (Pteropus mariannus mariannus), *a fruit bat shown here feeding on the pollen of a* Freycinetia *inflorescence, occurs in the Mariana Islands of the western Pacific. The Service considers it a category 1 listing candidate in the northern islands and a category 2 candidate to the south.

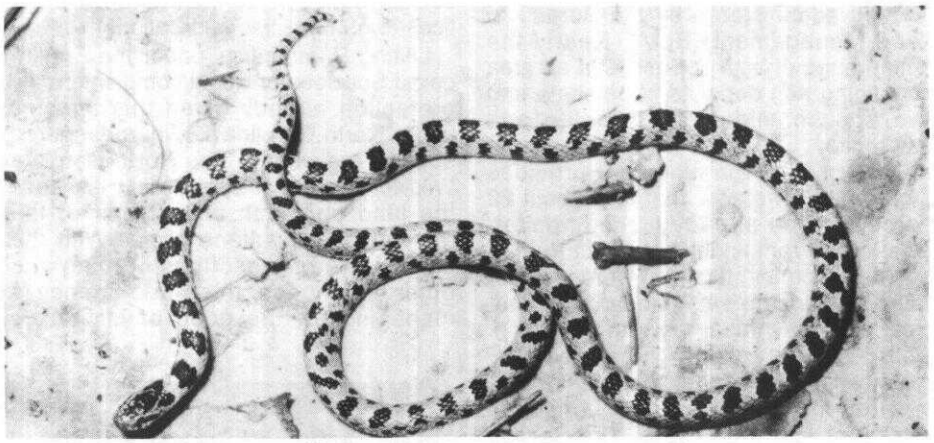


photo by C. Kenneth Dodd, Jr.

short-tailed snake (*Stilosoma extenuatum*), a category 2 candidate

In indicating exact numbers of candidate species, however, there is one more complication. Some of the entries in the Animal Notice of Review are not by species, even under the wide definition of "species" given in the Endangered Species Act. For example, some Hawaiian insects and snails are reported only at the generic level. According to some authorities, there appear to be 23 species of Hawaiian snout beetles in the genus *Rhyncogonus*. You will find this entry on page 550 of the Animal Notice as:

> Category 2, Hawaiian rhyncogunus snout beetles, *Rhyncogonus* 23 species, Family Curculionidae, HI.

Despite the problems of making an exact count, the totals in the 1989 Animal Notice of Review are:

ANIMAL CANDIDATE SPECIES (by notice entry)

Category 1	75	
Category 2	1397	(1566 species)
Total animal candidates	1472	(1641 species)
NON-CANDIDATE ANIMAL SPECIES		
Believed extinct (3A)	119	
Invalid names (3B)	40	
Status review indicates species not under threat (3C)	124	
Total non-candidate animals	283	

Listing Protection Proposed for Three Plant Species

During January 1989, three species of plants were proposed by the Fish and Wildlife Service for addition to the List of Endangered and Threatened Wildlife and Plants. If the listings become final, Endangered Species Act protection will be extended to the following:

Two Colorado Plants

The **Dudley Bluffs bladderpod (*Lesquerella congesta*)** and the **Dudley Bluffs twinpod (*Physaria obcordata*)** are small herbaceous perennials in the mustard family (*Brassicaceae*). They are restricted to barren outcrops of weathered shale strata in the Piceance Basin of northwestern Colorado. Because their habitat is overburden on land that may be subject to surface mining for oil shale, the Service has proposed to list both plants as Threatened species (F.R. 1/24/89).

There are five known populations of each species, all within Rio Blanco County. Most of the sites are on public land administered by the Bureau of Land Management (BLM). Nearly the entire range of both species is in an area containing rich deposits of oil shale and two sodium minerals, nahcolite and dawsonite.

Current BLM management provides protection to two sites that total about 20 percent of the already limited habitat. Most of the remainder is subject to mineral development. If mining were to occur without adequate safeguards, both species could be threatened with extinction. Listing these plants as Threatened species would require that their welfare be ensured in any proposed BLM mineral leasing or land exchanges. The Service and BLM will work together to help ensure that mineral development plans for the area are compatible with conservation of these plants.

Michaux's Sumac (*Rhus michauxii*)

This deciduous, rhizomatous shrub is sometimes called "false poison sumac" because of its superficial resemblance to *Rhus vernix*. Michaux's sumac is endemic to the eastern coastal plain and lower piedmont of North Carolina, South Carolina, and Georgia. Almost half of the 30 historically known populations have been lost, due at least in part to conversion of native habitat to agricultural and silvicultural operations; residential and commercial development; and the suppression of wildfires. Because these and other threats continue to face the remaining populations, the Service has proposed to list *R. michauxii* as Endangered (F.R. 1/6/89).

Currently, 16 populations are known to survive, 15 in North Carolina and 1 in Georgia. South Carolina's one historically reported population has disappeared, and the species is believed to be extirpated from that State. Only 7 of the 16 remaining populations are of significant size (100 or more plants). Further clouding the species' future is the fact that *R. michauxii* is dioecious—having separate male and female plants—and that only two of the remaining populations now contain individuals of both sexes.

Fire or some other suitable form of disturbance, such as mowing or careful clearing, is essential for maintaining the open habitat preferred by *R. michauxii*. Without such periodic disturbance, the habitat of this shade-intolerant species is gradually overtaken by vegetational succession. In addition to sites opened by fire, many of the areas where Michaux's sumac survives are on the edges of highway or railroad rights-of-way or cultivated fields. The nine populations located on roadsides, however, are vulnerable to the effects of highway widening projects or certain right-of-way maintenance practices (e.g., herbicide applications).

Listing *R. michauxii* under the Endangered Species Act would complement the protection already given this species under North Carolina's own endangered species legislation. The North Carolina Wildlife Resources Commission manages the land on which almost half of the remaining populations occur. With the careful use of prescribed burning and other techniques, this State agency is managing for the good of Michaux's sumac as well as for game animals. Most of the other public agencies and private landowners with *R. michauxii* habitat also have indicated a willingness to cooperate in the species' conservation.

Conservation Measures Authorized by the Endangered Species Act

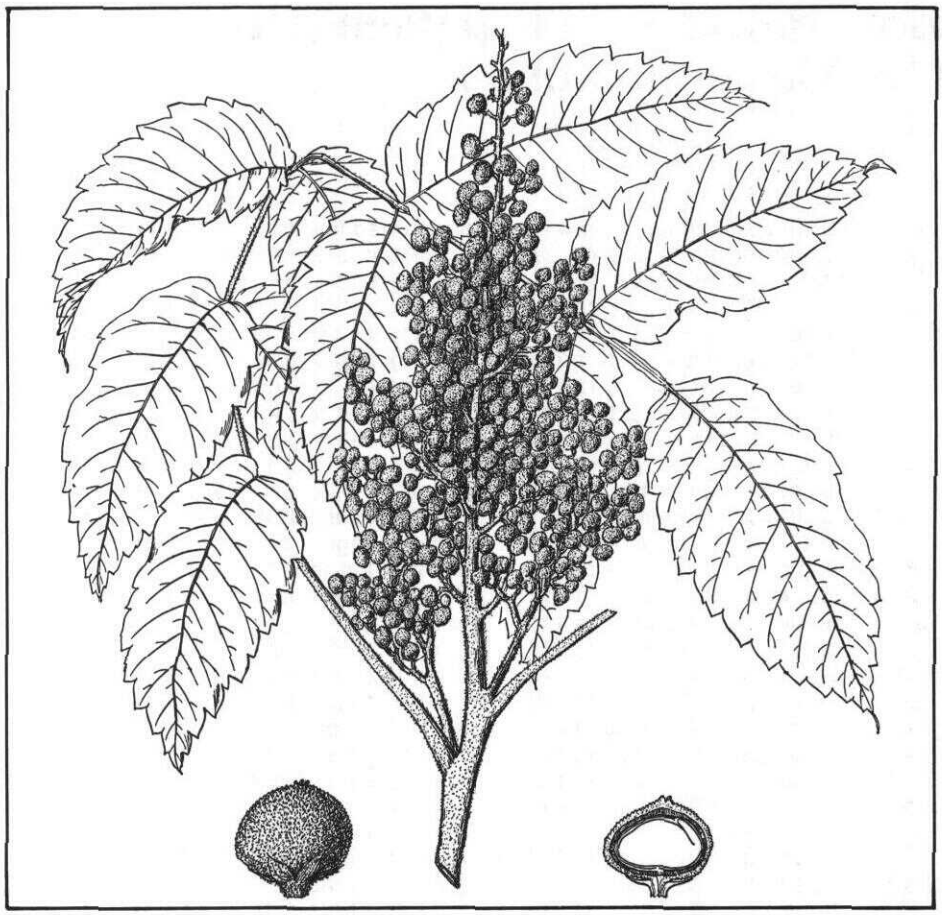
Among the conservation benefits provided to a species if its listing under the Endangered Species Act is approved are: protection from adverse effects of Federal activities; restrictions on take and trafficking; the requirement for the Service to develop and implement recovery plans; the authorization to seek land purchases or exchanges for important habitat; and the possibility of Federal aid to State or Commonwealth conservation departments that have signed Endangered Species Cooperative Agreements with the Service. Listing also lends greater recognition to a species' precarious status, which encourages further conservation efforts by State and local agencies, independent organizations, and individuals.

Section 7 of the Act directs Federal agencies to use their legal authorities to further the purposes of the Act by carrying out conservation programs for listed species. It also requires these agencies to ensure that any actions they authorize, fund, or carry out are not likely to jeopard-

(continued on next page)

photo by Steve O'Kane, Jr.

***Dudley Bluffs twinpod* (Physaria obcordata)**



drawing reprinted from *Garden and Forest* Vol. 8, No. 398 (1895)

***Michaux's sumac* (Rhus michauxii)**

Listing Protection

(continued from previous page)

ize the survival of a listed species. If an agency finds that one of its activities may affect a listed species, it is required to consult with the Service on ways to avoid jeopardy. For species that are proposed for listing and for which jeopardy is found, Federal agencies are required to "confer" with the Service, although the results of such a conference are nonbinding.

Further protection is authorized by Section 9 of the Act, which makes it illegal to take, possess, transport, or engage in interstate or international trafficking in listed animals except by permit for certain conservation purposes. For plants, it is unlawful to collect or maliciously damage any listed species found on lands under Federal jurisdiction. Removing or damaging listed plants on State and private lands in knowing violation of State law or in the course of violating a State criminal trespass law also is illegal under the Act. In addition, some States have their own more restrictive laws specifically against the take of State or federally listed plants.

Pesticides

(continued from page 1)

pressed substantial interest in the program. Specifically, it prohibited the EPA from enforcing the labeling program before September 15, 1988. Congress gave additional attention to the program in the 1988 Endangered Species Act Amendments, in which the EPA, in cooperation with the Departments of Agriculture and the Interior, was directed to set up a program for educating and fully informing the agricultural community about the pesticide labeling program. The amendments also require the EPA, Agriculture, and Interior to conduct a study of:

1) reasonable and prudent means to implement an endangered species conservation program that would allow continued production of food and fiber commodities;
2) the best methods for mapping restricted use areas;
3) alternatives to prohibitions of pesticides;
4) methods to improve coordination among agencies; and
5) means to implement the program to promote conservation and minimize impacts on pesticide users.

It must be emphasized that all existing biological opinions issued under Section 7 of the Act remain in effect. For various reasons, however, a number of consultations should be reinitiated, and the Service has so requested. For example, some biological opinions lack statements allowing for "incidental take" of listed species. For others, new biological and/or chemical data have become available.

Implementing existing and future biological opinions is the responsibility of the EPA. The Service is cooperating in every way possible to help ensure the success of the EPA's implementation program. The method of implementation should be one that provides the greatest degree of protection for the greatest number of species in the shortest time, consistent with the Act and the 1988 Amendments. It is probable that a variety of means will be appropriate. Preliminary indications are that some States will be able to provide protection to the species by working with the EPA to develop customized State programs (e.g., conservation agreements with private landowners). Maps designating restricted use areas will be required in other situations.

The Service is now completing a broad-based consultation involving 108 chemicals and over 160 species that were reviewed in earlier cluster consultations. This consultation is being conducted by an Interim National Pesticide Consultation Team that includes representatives from each of the Service's contiguous Regions. The team is using a novel method of analysis devised by the Service's Division of Environmental Contaminants. Particular attention will be given to the sections on reasonable and prudent alternatives and measures. The team will have a draft of the biological opinion ready for review shortly.

Balcomb, Richard, C. A. Bowen, D. Wright, and M. Law. 1984. Effects on wildlife of at-planting corn applications of granular carbofuran. Journal of Wildlife Management. 48:1353-1359

EPA. 1989. Notice of preliminary determination to cancel registrations of carbofuran products. OPP-30,000/48A. p. 47.

Halvorson, Gary L., 1988. "Federal Endangered Species and Pesticides—Past, Present, and Future." *Proceedings of Great Plains Agricultural Council, New Mexico*. 121-132.

Andean Condors Released in Experiment to Aid the California Condor

Michael D. Rees

Over remote, wind-swept mountains in Ventura County, 50 miles northwest of Los Angeles, California, some of the world's largest birds, with 9½-foot wing spans, are soaring where they never have been seen before. The birds are Andean condors (*Vultur gryphus*)—a species native to the high Andes of western and northern South America. The Fish and Wildlife Service released the birds at Hopper Mountain National Wildlife Refuge and an adjacent Nature Conservancy property to test various release and tracking techniques. Biologists hope to collect enough knowledge and experience in handling condors from this experiment to pave the way for the eventual reintroduction of the Endangered California condor (*Gymnogyps californianus*) in the mid-1990's. Only 28 California condors exist, all of them in captivity, while several thousand Andean condors survive in the wild in South America.

Three female captive-bred Andean condor chicks, approximately 3 months old, were brought to the release site in August 1988 so they could adjust to the area before they reached fledgling stage. The oldest of the condors, labeled Y-1, hatched at the San Diego Wild Animal Park on April 1, 1988. Y-2 came from the Service's Patuxent Wildlife Research Center in Laurel, Maryland, and Y-3 came from the Buffalo, New York, Zoo. The birds were housed for nearly 4 months in a net-covered enclosure on a rock outcrop, and were kept isolated to prevent them from becoming habituated to the presence of people. Biologists entered and left the area only when rocks and structures or the cover of darkness shielded them from view of the birds.

On the night of December 16, while the three Andean condors were in the roost box portion of their release site, biologists removed the netting that had previously confined the birds. Researchers from the Service, Los Angeles Zoo, and San Diego Wild Animal Park monitored the condors round-the-clock from six blinds strategically hidden in the area. Each of the birds was equipped with radio telemetry equipment to permit continued monitoring from a distance once they began longer flights.

On the morning of December 17, the birds emerged from their roost box. At first, they merely stared at their surroundings, aware that something was amiss. But within a half-hour, Y-1 began flapping her wings and eventually hopped up to the top of the roost box. A short time later, she turned toward the wind and took her first flight, a 2-minute soar of 350 feet, before landing in the rocks below the release site. Y-1 remained in the rocks to sun most of the day and roosted there that night. She then slowly "jogged" back up the bluff, through the chaparral, taking over another day to rejoin the other birds. Not long afterward, however, Y-1 took off on another flight. Y-3, a younger condor, took a much longer time getting airborne. But on December 22, she took off on her first solo flight, repeating the same flight down slope that Y-1 had taken earlier. She, too, then made her way back to the release site.

Y-1 and Y-3 have now gained experience and confidence in flying and are making longer trips, both in time and distance, to explore their new environment. As of February 15, they still returned to their release site at night, where they have been given food. The two birds have begun roosting in a tree away from the release site. Y-2, however, did not progressed as rapidly as the other two birds.

As the second stage of the experiment, three more Andean condors were re-

(continued on next page)

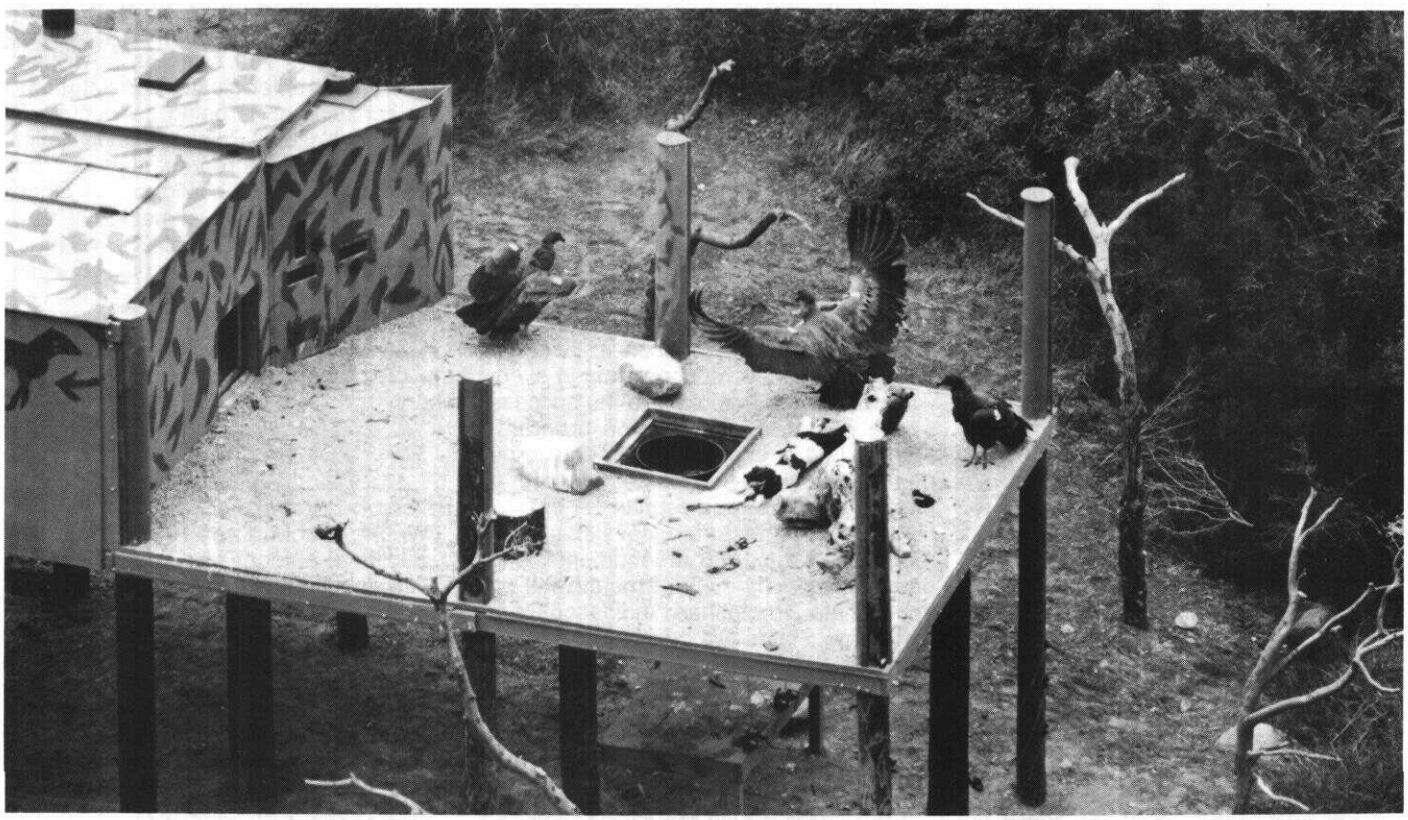


photo by David Clendenen

Andean condors at the release site within the Sespe Condor Sanctuary

leased on January 21 at the adjacent Sespe Condor Sanctuary in the Los Padres National Forest, approximately 3 miles from the refuge site. A fourth condor is still being held at the site until she matures. To prevent the reproduction and establishment of an Andean condor population in California, biologists are releasing only female birds. For the next 2 years, the non-native condors will be followed to document their daily movements and adjustment to the new area.

Although there are more Andean condors than California condors, the Andean condor also is listed as an Endangered species in its native South America and is on Appendix I of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). When the Andean condor release experiment ends in the fall of 1990, all of the Andean condors will be recaptured and taken to Colombia for reintroduction into areas where the species was extirpated several decades ago. Six male Andean condors, which also hatched in captivity in 1988, are currently at the Los Angeles Zoo and San Diego Wild Animal Park awaiting their release into Colombia later this year. The Fish and Wildlife Service will be training three Colombian biologists on release techniques.

As the BULLETIN went to press, we received word that Y-2 and Y-3 have been lost to the release experiment. Y-2 was captured on February 19 due to physical and behavioral problems. She was taken to the Los Angeles Zoo where she will be examined to determine the extent and possible reasons for her "deficiencies." Y-3 was found dead on February 24 directly underneath a power line. It is believed that she brushed or collided with the lines during flight and was electrocuted.

Y-1 and the remaining four Andean condors at the Sespe Condor Sanctuary site are doing well. Immediately following the death of Y-3, Y-1 flew to the Sespe Condor Sanctuary site and began interacting with the other birds. As of March 1, the three older Sespe Condor Sanctuary birds (R-4, R-5, and R-6) were all flying and exploring the surrounding area. The youngest bird, R-7, had begun exercising its wings in preparation for flight.

Meanwhile, the Service's California condor propagation effort is proceeding. On February 20, researchers at the Los Angeles Zoo noticed that one of its California condors had laid an egg, but it later proved to be infertile. Two more eggs were laid by California condors at the San Diego Wild Animal Park on February 21 and sometime during February 23-24. Only one of these eggs is fertile, and it was laid by the same condors that successfully produced a chick last year. If all goes well, the new egg should hatch in mid-April.

Endangered Beach Mice Repopulate Florida Beaches

Karen Fleming and N. R. Holler
Alabama Cooperative Fish and Wildlife Research Unit
Auburn University, Alabama

A trapping survey for the Perdido Key beach mouse (*Peromyscus polionotus trissyllepsis*) was conducted last summer at Gulf Islands National Seashore on Perdido Key, Florida. The survey indicates that this population, which was reintroduced during 1986-1988, is successfully reproducing and expanding into available dune habitat. In July 1988, 55 individual mice were live-trapped in 2,185 trap-nights. Mice were trapped along a 3.9-mile (6.2-kilometer) stretch of dunes, and mouse sign was found along the dunes for an additional 2.9 miles (4.6 km).

Historically, this subspecies inhabited dune habitat extending from Perdido Bay, Alabama, to Pensacola Bay, Florida. Ideal habitat for beach mice consists of well-developed dunes vegetated with sea oats (*Uniola paniculata*), beach grass (*Panicum amarum*), and bluestem (*Andropogon marinus*). Beach mice live in burrows constructed in the dunes and are believed to feed primarily on beach grass seeds, herb seeds, and insects. Extensive development, heavy human traffic along Perdido Key, and tropical storm damage to the dunes led to the subspecies' decline, and it was listed in 1985 as Endangered. (See summary in BULLETIN Vol. X, No. 7.)

Perdido Key was surveyed for beach mice in July 1979, and researchers used trap data to extrapolate population numbers. At the time, the estimated number of remaining Perdido Key beach mice was 78 individuals—26 at Gulf State Park (Baldwin County, Alabama) and 52 at Gulf Islands National Seashore (Escambia County, Florida). No mice were found on the central portion of the Key, although about 1.4 miles (2.3 km) of dune habitat (Perdido Key State Preserve) is publicly owned.

Perdido Key beach mouse numbers declined considerably following damage to the dune habitat from Hurricane Frederick in September 1979. Because of the Key's narrow configuration, its dune system is particularly vulnerable to hurricanes. In 1982, only 13 beach mice were trapped at Gulf State Park; no beach mice were found on any other area of the Key, and the Gulf Islands National Seashore population was assumed to be extirpated. Population growth may have occurred at Gulf State Park following the 1981 survey, but the estimated population for this area in April 1986 remained at 31 or fewer individuals.

Recovery efforts for the Perdido Key beach mouse began in November 1986, when the first three pairs were translocated from Gulf State Park to Gulf Islands National Seashore (see BULLETIN Vol. XII, No. 8). Twelve additional pairs were relocated between January 1987 and April 1988. Initially, the translocated mice were released into a large protective enclosure and allowed to establish burrows before outlets were made in the structure. Later releases were made into small enclosures where mice were held for one night. Sunflower seeds and water were provided for the enclosed mice. A follow-up survey in November 1987 revealed that the reintroduced population was reproducing. In addition to the one released mouse that was trapped, three unmarked mice were captured. Two of these unmarked mice were females, one of which was pregnant and lactating. Furthermore, mice or mouse sign were found along about 0.7 miles (1.2 km) of dune habitat on Gulf Islands National Seashore.

(continued on page 11)

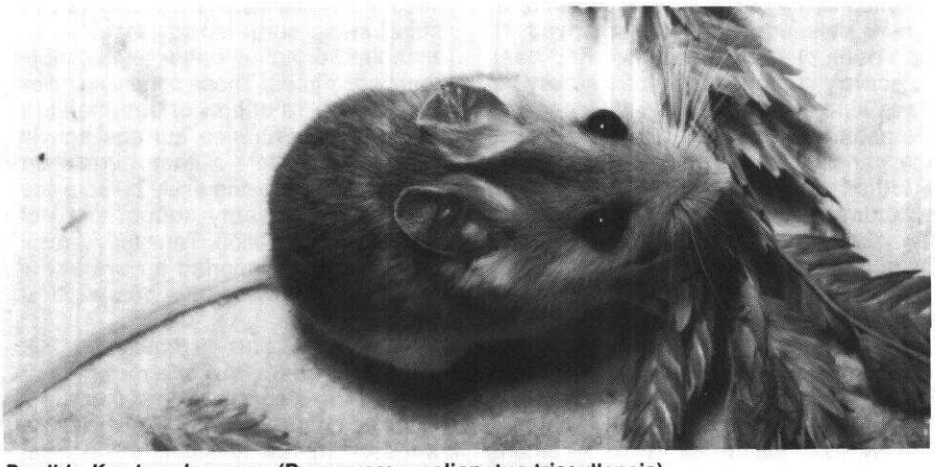


photo courtesy of the Alabama Cooperative Fish and Wildlife Research Unit

***Perdido Key beach mouse* (Peromyscus polionotus trissyllepsis)**

Status of the Red Hills Salamander is Reassessed

C. Kenneth Dodd, Jr.
National Ecology Research Center
Gainesville, Florida

The Red Hills salamander (*Phaeognathus hubrichti*) is a fossorial (or burrowing), monotypic species confined to the Red Hills area between the Alabama and Conecuh Rivers in south-central Alabama. In the early 1970's, concern grew about the effects that certain forestry practices (particularly clear-cutting) and salamander collecting were having on the few populations known at the time. Responding to this concern and to the results of a status survey conducted by Thomas French of Auburn University, the Red Hills salamander was listed in 1976 as a Threatened species (see BULLETIN Vol. II, No. 1).

Despite Federal protection, some biologists have expressed concern that certain forestry practices continue to adversely affect the salamander. In response, the Fish and Wildlife Service's Jackson, Mississippi, Field Office contracted the National Ecology Research Center to reevaluate the status of salamander populations and recommend areas for habitat acquisition.

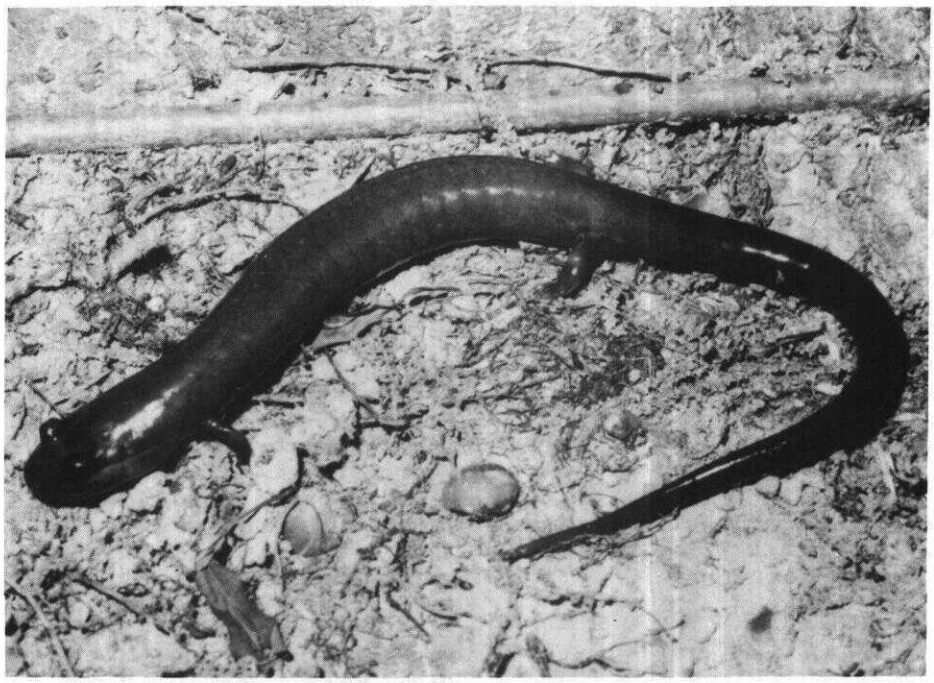


photo by C. Kenneth Dodd, Jr.

***Red Hills salamander* (Phaeognathus hubrichti)**

During the spring and summer of 1988, I surveyed 144 sites within the salamander's range. French's earlier survey had located Red Hills salamander burrows at 73 of 145 sites examined. In contrast, I found burrows at 124 of 144 sites. Ninety-two of the sites were surveyed by both studies. Both surveys found burrows at 72 of these 92 sites and none at 12 other sites. In addition, at the same 92 sites, each survey located burrows at 4 sites where the other survey did not.

Data for comparison of habitat changes between 1976 and 1988 were available for 91 of the 92 jointly surveyed sites. Of these 91 sites, 54 appeared similar to earlier descriptions, 19 had improved habitat conditions, and 18 were adversely affected by timber cutting since 1976. Of the 19 sites judged to have improved, 18 had been cleared of trees or had been selectively cut prior to French's survey but have since regrown a full tree canopy. (None of these improved sites had been mechanically prepared for replanting.) In addition to these 91 sites, 14 others examined in the latest survey were damaged by timber cutting; their status in 1976, however, was unknown.

At sites that were unchanged or where conditions have improved since 1976, Red Hills salamanders were common at 64.8 percent and 52.6 percent, respectively. However, at the sites that have deteriorated, salamanders were common at only 16.7 percent. Most (61.1 percent) of the sites where Red Hills salamanders were uncommon in the latest survey had been altered since 1976. In contrast, salamanders were uncommon at only 18.5 percent of the unchanged sites and 36.8 percent of the sites where habitat conditions had improved.

During the latest survey, additional data were gathered and quantified on such variables as slope height, angle, moisture, soil pH, and various characteristics of the burrows. This information can be used to predict with greater accuracy the location of other viable Red Hills salamander populations and the probable impacts of various land use practices.

Ideal Red Hills salamander habitat consists of steep north-facing slopes in the Tallahatta Formation under a full canopy of hardwood trees. These conditions allow considerable retention of soil moisture and probably enhance surface activity by the salamanders at their burrow entrances, where feeding likely takes place. The habitat probably supports a rich invertebrate population. Ten study sites in optimal habitat supported an average of five salamander burrows per hundred square meters.

The presence and distribution of Red Hills salamanders at a site depends on how high the slope is, where the site is positioned on the slope (upper, middle, or lower section), and habitat alteration. Salamander habitat on higher slopes is less likely to be logged or to be impacted by timber cutting that may occur above or below the slope. Where salamanders are common, burrows are positioned on the upper two-thirds of the slope; however, where salamanders are not common, most burrows were found in the more stable middle section of the slope. Regardless of salamander abundance, most burrows at clear cut and selective cut sites are concentrated in the uncut, protected (middle) section. The middle section of the slope is likely to be less affected by disturbances than sections above or below it, and it may be less prone to desiccation than these disturbed areas.

Clear cutting negatively affects salamander populations by increasing soil surface disturbance and desiccation. In turn, invertebrate prey populations probably decrease, at least initially. Some areas clear cut within the past 2 years retain burrows in protected seeps, under stumps, or along ledges that provide some degree of protection. At other clear cut sites, however, no burrows remain.

Can populations affected by selective timber cutting recover? The data from sites where trees have been cut since 1976 but where habitat conditions nevertheless are improving suggest that this is possible, although the recovery process

(continued on next page)

is probably very slow. Some populations likely never recover, depending on their viability prior to cutting. If sufficient time is allowed to rebuild population size, if catastrophic events do not affect the remaining animals, and if the habitat recovers quickly, then populations probably will slowly recover. The type of forest replanted and the level of selective cutting also probably influence recovery potential.

Despite 12 years of Federal protection, forestry practices detrimental to the Red Hills salamander continue. This was most dramatically in evidence at clear cuts in Monroe, Butler, and Conecuh Counties. Other areas were observed where clear cuts or very heavy selective cutting encroached on Red Hills salamander habitat. Most logging companies state that they "mark out" salamander habitat to ensure the conservation of the species, but incorporating better oversight of existing and planned cutting into company programs would help to ensure that prime habitats are not destroyed in the future.

The following suggestions could reduce impacts on salamander habitat from timber harvesting activities:

(1) Clear cutting should be avoided on slopes containing Red Hills salamander burrows, especially on the steeper slopes.
(2) Mechanical site preparation should be avoided. This practice destroys burrows and exposes the soil to desiccation.
(3) Woody litter should be maintained to provide shade and maintain the moisture content of the soil. In addition, woody litter is important for the preservation of the microarthropod prey community and for nutrient conservation.
(4) Selective cutting *may* not adversely impact salamander populations if carried out in such a manner to minimize surface disturbance to the upper and middle sections of the slopes where most salamander burrows are found. In any case, a tree canopy providing over a two-thirds shade cover is recommended.
(5) When cutting areas above or below a slope that contains Red Hills salamander burrows, a buffer area should be left. If this buffer is excluded, the sun will dry out the soil surface despite the presence of vegetation on the slope. The necessary size of the buffer will vary depending on sun angle and slope orientation, but it should provide sufficient shade at all times of day.
(6) Chemical sprays having adverse effects on amphibians, their eggs, or the salamander's invertebrate prey should be avoided.

With care in the planning of forestry operations, acquisition of major habitats (I recommended 25 areas totalling 1,764 acres or 741 hectares), conservation agreements and easements to maintain the viability of remaining populations, and continued research on biological and management related questions, the long-term survival and recovery of Alabama's only endemic vertebrate can be ensured.

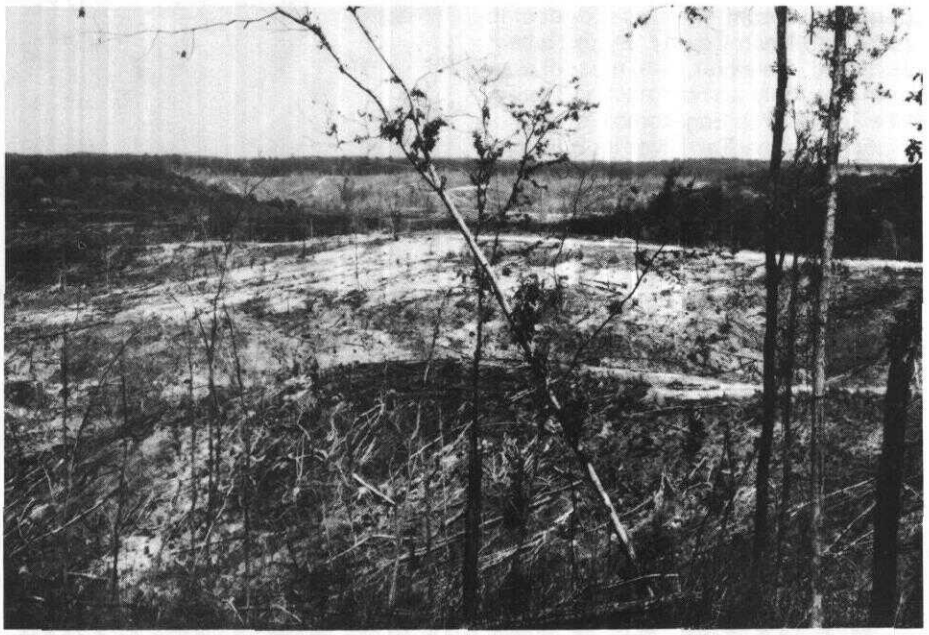


photo by C. Kenneth Dodd, Jr.

Intensive logging damages Red Hills salamander habitat by soil disturbance and dessication.

Beach Mice

(continued from page 9)

The recovery effort for the Perdido Key beach mouse is a cooperative project involving the Florida Game and Fresh Water Fish Commission, National Park Service, Fish and Wildlife Service, Alabama Department of Conservation, and Alabama Cooperative Fish and Wildlife Research Unit.

Recovery efforts also are under way for another Endangered subspecies, the Choctawhatchee beach mouse (*P. p. allophrys*). This mouse has suffered considerable habitat loss as a result of beachfront development. Found only in Florida, its original range extended along the dune system from the entrance to Choctawhatchee Bay to the entrance of St. Andrew's Bay. Before reintroduction efforts for this beach mouse began in January 1987, occupied habitat was restricted to a 3.5-mile (5.6-km) stretch of dunes in the Topsail Hill (Walton County) area and a 5.8-mile (9.4-km) stretch of dunes on Shell Island (Bay County).

In January 1987, eight pairs of Choctawhatchee beach mice were translocated from Shell Island to Grayton Beach State Recreation Area (Walton County). Six additional pairs were released at a second location on Grayton Beach in December 1987. Release methods were similar to those used in the Perdido Key beach mouse reintroductions except that only small enclosures were used. Trapping surveys conducted in October 1987 were not promising; no mice were captured and only a few tracks were observed. One unmarked mouse was captured and mouse tracks were observed at both sites in December 1988. Further trapping attempts will be made.

Reestablishment of the Choctawhatchee beach mouse is a cooperative effort involving the Florida Game and Fresh Water Fish Commission, Florida Department of Natural Resources, U.S. Fish and Wildlife Service, and Alabama Cooperative Fish and Wildlife Research Unit.

Recovery efforts for these Endangered subspecies of beach mice include maintenance of a breeding colony at Auburn University, Alabama. Perdido Key beach mice have not yet reproduced in captivity, but attempts to breed captive Choctawhatchee beach mice have been successful.

Tar River Spiny Mussel Recovery Efforts Under Way

Dick Biggins
Asheville, North Carolina, Field Office

The Tar River spiny mussel (*Elliptio (Canthyria) steinstansana*) is one of only three known spiny freshwater mussel species, and it is among the rarest of all federally listed mussels. This species, which was listed on July 29, 1985, as Endangered (see BULLETIN Vol. X, No. 7), was first discovered in 1966 in the Tar River near Old Sparta, Edgecomb County, North Carolina. Subsequent collections indicate that the species once inhabited North Carolina's Tar River from Pitt County upstream through Edgecomb County into Nash County. By the time it was listed, however, the mussel was known from only a short reach (12 miles) of the Tar River in Edgecomb County.

Surveys of the Tar River in 1986 and early 1987 failed to locate any live specimens and the Tar River spiny mussel was thought to be extinct. However, with funds provided by the U.S. Fish and Wildlife Service under Section 6 of the Endangered Species Act, biologists from the North Carolina Wildlife Resources Commission found four live specimens in the Tar River (Edgecomb County) during the summer of 1987. In 1988, Commission biologists widened the search area, and although no additional specimens were found in the Tar River, three live spiny mussels were discovered in a Tar River tributary. The tributary has good to excellent water and substrate quality, and the stream's relatively small size may make protection efforts easier.

In addition to surveying for live specimens, biologists are conducting life history studies. The Tar River spiny mussel is too rare to bring into the laboratory for studies, but a related and somewhat less rare species—the James spiny mussel (*Fusconia collina*)—is being used as a surrogate. This species, which itself was listed July 22, 1988, as Endangered, is known from parts of the James River system in southwestern Virginia and adjacent West Virginia. Biologists with the Virginia Cooperative Fishery Research Unit have received funds from the same Section 6 grant to conduct this project. They have determined that eight minnow (family Cyprinidae) species serve as hosts for the mussel during its larval, parasitic stage. This winter, age and growth data will be analyzed, and plans are under way to develop techniques to propagate the mussel.

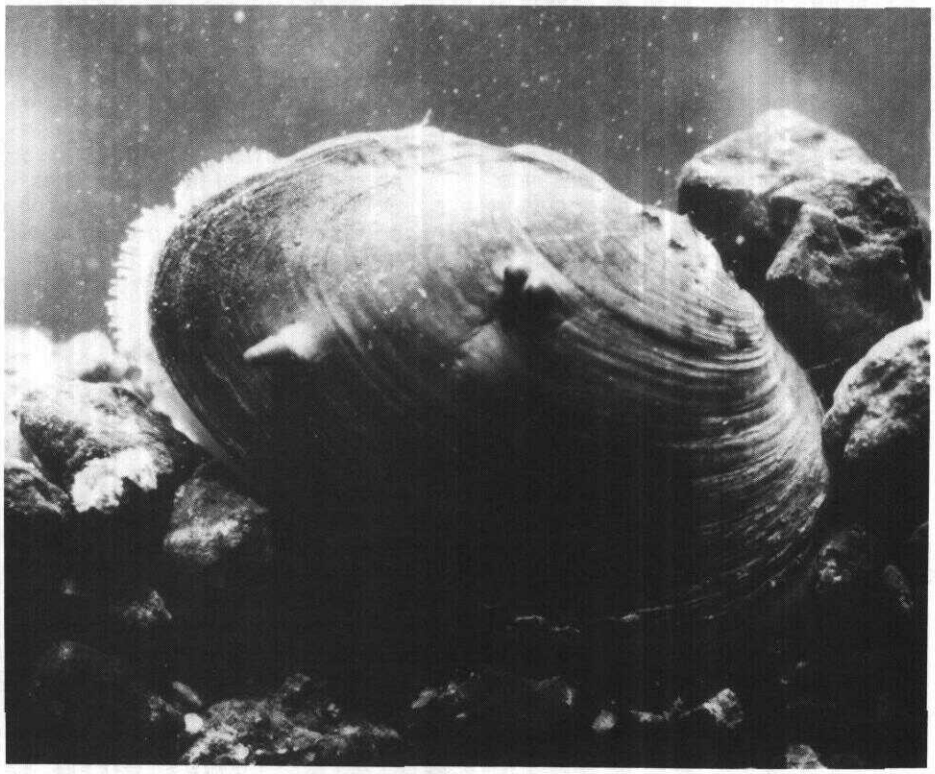


photo by Dick R. Biggins

Tar River spiny mussel

The survey data will delineate the habitat that needs protection within the Tar River system. This information, coupled with life history data from the surrogate species research, may allow for management of the Tar River spiny mussel's habitat. If propagation studies are successful, reintroductions may be possible. The future of the Tar River spiny mussel is far from secure, but work toward that goal is making progress.

Two Utah Plants Proposed for Delisting

Two plants native to the State of Utah were proposed recently by the Fish and Wildlife Service for removal from Endangered Species Act protection. The **purple-spined hedgehog cactus (*Echinocereus engelmannii* var. *purpureus*)** now is believed not to be a distinct taxon, and enough new populations of the **Rydberg milk-vetch (*Astragalus perianus*)** have been discovered to indicate that this species is not in danger.

New studies found that the purple-spined hedgehog cactus is merely a sporadically occurring vegetative phase of *Echinocereus engelmannii* var. *chrysocentrus*, a common plant in the Mojave Desert of California, Arizona, Nevada, and Utah. The 1969 description of *E. e. purpureus* as a distinct variety in southwestern Utah was based largely on its darker and shorter spines. A 1988 review, however, demonstrated that there are many morphological variations within the range of *E. e. chrysocentrus* and that none of them, including *E. e. purpureus*, exhibit any independent population integrity. If *E. e. purpureus*, which is currently listed as Endangered, cannot be defended as a distinct species, subspecies, or taxonomic variety, it is not eligible for Endangered Species Act protection. Therefore, the Service proposed it for delisting (F.R. 1/19/89).

The Rydberg milk-vetch, a low-growing herbaceous plant in the pea family (Fabaceae), was listed as a Threatened species in 1978, when only two populations were known. Surveys of potential habitat since that time have located 10 additional populations. Most *A. perianus* habitat is on federally managed lands (Dixie and Fishlake National Forests), and all 12 of the currently known populations are healthy. Because activities such as mining and road construction still could threaten portions of the species' habitat but would not result in its extinction, the Service believes that Endangered Species Act protection for *A. perianus* is not needed. Consequently, this species was proposed for delisting (F.R. 10/11/88).

New Publications

The Utah Museum of Natural History, in cooperation with the Ecology Center of Utah State University, has published *The Atlas of the Vascular Plants of Utah*, by Beverly J. Albee, Leila M. Shultz, and Sherel Goodrich. The 685-page Atlas includes 2,438 maps of plants growing in Utah in more than one location without benefit of cultivation. The data for the dot maps were obtained by critical examination of some 400,000 specimens located in various herbaria in Utah. Under each of the maps is a brief description of the plant, including flowering time, customary habitat, and altitudinal range. The book is available for $26 plus $4 shipping and handling from the Utah Museum of Natural History, University of Utah, Salt Lake City, Utah 84112. (Utah residents should add $1.65 sales tax per copy.)

* * *

The Texas Parks and Wildlife Department has published *Endangered, Threatened, or Protected Native Plants of Texas*. The publication is in a 3-ring binder format to provide for future additions, deletions, and revisions. (Purchasers will be notified as supplements become available.) All State and federally-listed Endangered and Threatened plants are included in the reference. The publication includes physical descriptions of the plants, line drawings showing key characters, county distribution maps, and habitat descriptions. It is available for $8.50 (including postage and tax) from the Texas Parks and Wildlife Department, 4200 Smith School Road, Austin, Texas 78744.

* * *

The Fish and Wildlife Service has recently published the following publications on Endangered species, candidates, or their habitats:

- Biology and conservation of the interior least tern: a literature review. Paul L. Whitman. Biological Report 88(3).
- Annotated historical records of bald eagles from the northern United States. James P. Mattsson. Biological Report 88(10).
- Synopsis of the biological data on the loggerhead sea turtle *Caretta caretta* (Linnaeus 1758). C. Kenneth Dodd, Jr. Biological Report 88(14).
- Status of the marbled murrelet in North America: with special emphasis on populations in California, Oregon, and Washington. David B. Marshall. Biological Report 88(30).
- Tamaulipan brushland of the lower Rio Grande Valley of south Texas: description, human impacts, and management options. S.E. Jahrsdoerfer and D.M. Leslie, Jr. Biological Report 88(36).

Requests for these Service publications should be sent to the Publications Unit, U.S. Fish and Wildlife Service, Washington, D.C. 20240.

The fourth edition (1988) of the California Native Plant Society's *Inventory of Rare and Endangered Vascular Plants of California*, edited by James P. Smith, Jr., and Ken Berg, is a 168-page reference containing information on more than 1,500 of California's rarest plants. All State and federally-listed plants and listing candidates are covered. Each entry in the Inventory provides a summary of information on the distribution and habitat of the species, identifies the species' rarity and degree of threat, and notes the plant's official State and Federal status. Topographic quad data are included for more than 1,000 plants. This new edition has added more than 100 plant entries to the Inventory, revised and updated status and distribution information in the entries, and added new appendices that list plants by county and family. It also is organized alphabetically within families by scientific name. The Inventory is available for $19.95, plus $1.75 for shipping, from the California Native Plant Society, 909 12th Street, Suite 116, Sacramento, California 95814. (California residents must pay appropriate local sales tax.)

* * *

The National Museum of Natural Sciences in Ottawa, Canada, has published the fourth and final part of the *Atlas of the Rare Vascular Plants of Ontario*, edited by K.M. Pryer and G.W. Argus (1987). This volume concludes a project to map and describe 542 rare plant species; Part 1 of the Atlas was published in 1982. Each rare species account includes scientific and common names, Ontario dot maps based on verified herbarium specimens, North American range maps based on published sources, information on habitat and rare status elsewhere, and pertinent notes and references. The Atlas is available from the Rare and Endangered Plants Project, Botany Division, National Museum of Natural Sciences, P.O. Box 3443, Station D, Ottawa, Ontario K1P 6P4, Canada. To cover postage and handling, include a check or money order payable to the Receiver General for Canada for $6 U.S. ($5 in Canada). A limited number of the earlier parts are still available and will be included for new recipients of the Atlas.

* * *

The 1988 Plant Conservation Resource Book, published by the Center for Plant Conservation, is the first comprehensive list of over 500 professionals and offices involved in conserving rare plants native to the United States. The book includes botanists and other contacts in the Federal and State governments, State heritage programs, native plant societies, The Nature Conservancy, and other national private organizations that are working on plant conservation programs. The book also includes information on rare plant laws and rare and endangered plants by State. The 96-page publication is available from the Center for Plant Conservation, 125 Arborway, Jamaica Plain, Massachusetts 02130, for $9.00 (including postage).

* * *

Regional News

(continued from page 2)

privately owned island south of Aransas National Wildlife Refuge. It was foggy as three birds the hunters thought were snow geese (*Chen hyperborea*) flew over the blind. One of the birds was shot and later identified by leg markers as a 4-year-old female whooping crane. She and her mate had returned to Aransas in the fall with their first chick. The hunters turned themselves in to a Texas Parks and Wildlife Department officer, and charges are pending in Federal court.

* * *

A fall census of Mt. Graham red squirrels (*Tamiasciurus hudsonicus grahamensis*) was accomplished by personnel from the U. S. Forest Service, Arizona Game and Fish Department, University of Arizona, and the Fish and Wildlife Service. Post-breeding populations were estimated to be between 228 and 178, depending on whether or not questionable activity areas are included in the estimate. Spring pre-breeding populations were estimated at about 207. Failure of Engelmann spruce (*Picea engelmannii*) and corkbark fir (*Abies lasiocarpa* var. *arizonica*) cone crops, the red squirrel's primary food, is the leading cause of recruitment failure. With reduced winter food stocks, spring populations may be critically low. Winter checks on current activity areas are planned.

* * *

The Bureau of Land Management is planning to construct a fence this year to protect a population of the Arizona cliffrose (*Cowania subintegra*). This Endangered species occurs on limestone soils in central Arizona, where it faces threats from mining, off-road vehicle use, land development, and grazing by cattle, burros, and mule deer. The fence is intended to alleviate these threats.

* * *

Region 4 — The Service is considering whether or not to propose listing all free-living mountain lions (*Felis concolor*) occurring in the eastern United States as Threatened under the Similarity of Appearance provisions of the Endangered

(continued on page 14)

Regional News

(continued from page 13)

Species Act. In recent years, mountain lions, also known as cougars, pumas, or panthers, have been sighted in many eastern States. Some of these animals have been hunted and killed as unwanted predators. Most of the hunted animals probably were individuals of non-listed subspecies (western mountain lions) that either escaped from captivity or were deliberately released, but others may have been members of Endangered subspecies: the Florida panther (*F. c. coryi*) and the eastern cougar (*F. c. couguar*).

Because it is almost impossible to distinguish among the listed and unlisted subspecies, it has been almost impossible to prosecute cases of illegal take. Therefore, the Service believes that the only way to provide the necessary protection for the Endangered Florida panther and eastern cougar may be to protect all free-living mountain lions in the eastern United States under the Similarity of Appearance provision. If this approach is pursued, the Service will publish a proposed rule in the *Federal Register* and all interested parties will have 60 days to comment.

* * *

A formal Section 7 consultation has been reinitiated for the Tennessee Valley Authority's (TVA) Columbia Dam project on the Duck River in south-central Tennessee. An initial biological opinion was issued on this project in 1979. That biological opinion found that the project, as designed, would likely jeopardize the survival of two listed freshwater mussels, the birdwing pearly mussel (*Conradilla caelata*) and Cumberland monkeyface pearly mussel (*Quadrula intermedia*) by permanently flooding their free-flowing stream habitat. However, the Service determined that a mussel conservation program proposed by TVA would be an acceptable alternative if it were successfully completed prior to inundation of the mussel habitat. The TVA pursued the mussel conservation program, but so far has been unsuccessful in completing it. Recently, local project proponents, who still want the Columbia Dam completed, asked for a reinitiation of Section 7. The Service is now reviewing project alternatives involving lower pool levels and other options. A biological opinion on these new alternatives is scheduled to be issued soon.

* * *

The Service's Caribbean Field Office has completed status surveys for two listing candidates, the least tern (*Sterna albifrons*) and the southeastern snowy plover (*Charadrius alexandrinus*). The least tern nests in only three coastal wetlands in Puerto Rico and in St. Croix, U.S. Virgin Islands. All of the Puerto Rican sites are threatened by development projects. Nesting success for the tern is greatest at the Sandy Point National Wildlife Refuge in St. Croix. The southeastern snowy plover is known from only three sites in the Caribbean from Puerto Rico to St. Ritts. In Puerto Rico, it nests only on the Cabo Rojo salt flats in the southwestern portion of the island. The salt flats, an essential nesting and foraging area for several migratory and resident shorebirds, is under intense pressure for development.

* * *

An Army Corps of Engineers dredging operation is depositing spoil on an area in North Carolina that supports the second largest known population of seabeach amaranth (*Amaranthus pumilus*). This is just one of the threats facing this plant, a listing candidate, which once occurred on barrier islands and beaches from Massachusetts to South Carolina. Based on status surveys funded by Regions 4 and 5, the species has been extirpated from all areas except some sites in North and South Carolina. The surviving populations in these States are threatened by coastal development along the eastern seaboard, off-road vehicles, dune restoration projects, construction of groins and breakwaters, recreational impacts, and natural causes (such as hurricanes).

This plant has no close relatives, so its survival contributes to botanical diversity. It also serves as a beach stabilizer. In addition, the nutritional value of *Amaranthus* is high because the seeds contain a high percentage of lysine, an essential amino acid generally found in low amounts in other grains and in the other species within this genus.

* * *

Status surveys have been conducted for three plants that are candidates for listing proposals: Cantino's false dragonhead (*Physostegia longisepala*), the Louisiana blue star (*Amsonia ludoviciana*), and the plumleaf azalea (*Rhododendron prunifolium*). Before these surveys were conducted, these plants were known from only a dozen or fewer populations, but now each plant is known to have at least 40 populations.

The Louisiana Heritage Program found 48 populations of *Physostegia* and 40 populations of *Amsonia*. Both plant species are herbaceous. *Physostegia* occurs near the edges of mixed hardwood-pine flatwoods in the coastal prairie areas of Louisiana and Texas. *Amsonia* occupies diverse habitats in Louisiana and Georgia. In Louisiana, the species is found in pine flatwoods, small-stream riparian forests, and higher-position, bottomland forests. In Georgia, *Amonsia* grows near granite outcrops. One historical *Amsonia* location from Mississippi is reported as an open savanna. Both *Amsonia* and *Physostegia* frequently occur in altered habitats, such as roadside and powerline rights-of-way and artificial drainageways.

The Georgia Natural Heritage program discovered 41 populations of the third plant, *Rhododendron prunifolium*. The shrub is known from southeast Alabama and southwest Georgia, where it occurs in rich, wooded ravines along the Chattahooche River and its tributary valleys.

* * *

A status review was conducted recently on the Blue Ridge population of the green salamander (*Aneides aeneus*) by the Service's Asheville, North Carolina, Field Office and a representative of the South Carolina Wildlife and Marine Resources Department. This disjunct population has disappeared from 78 percent of its known range in South Carolina, North Carolina, and Georgia over the past 10 to 15 years. Successful reproduction has been documented at only three of the active sites in recent years. Since there apparently have been no significant disturbances in the habitat, it is possible that the species is threatened by acid rain and/or the successive years of severe drought in the region.

* * *

Region 5 — Peregrine Fund personnel report that the number of reestablished peregrine falcon (*Falco peregrinus*) pairs in eastern States continued to increase through the 1988 field season. Last year also proved to be a good one for releasing captive-produced young, with a total of 96 birds hacked in 8 States (Maine, New York, Massachusetts, West Virginia, Virginia, North Carolina, South Carolina, and Georgia).

During 1988, we had 67 confirmed pairs on territories from Maine to North Carolina. Fifty-one of these pairs nested, and 39 pairs produced 90 fledglings. The number of nesting pairs increased by 21 percent over the previous year's figure, compared to a 40 percent increase in 1987, 20 percent in 1986, 36 percent in 1985, 78 percent in 1984, 80 percent in 1983, 25 percent in 1982, 100 percent in 1981, and 100 percent in 1980.

A Regional look at nesting results in the 1988 breeding season again indicates that severe spring weather plays an important role in the reproductive failure of some pairs. Maine and New Hampshire had a total of 11 pairs on territories but only 6 pairs nested. Two of these pairs apparently renested after the loss of their first clutches, but even then only three of the six nesting pairs succeeded in producing a total of four young for the region. Severe storms that blew through the region during the incubation season may account for the nesting failure of other pairs. In contrast, 10 pairs nesting in areas where the storm did not hit so hard (in Vermont and the Adirondack Mountains of New York) reared at least 19 young.

The reproductive rate for peregrines in the mid-Atlantic region, all of them nesting on towers, bridges, and buildings, was the highest in the East. Thirty of 35 territorial pairs laid eggs and produced 63 young. If we add to that number the 12 young hatched from the eggs we removed from bridges, total production was 75 young or

(continued on page 15)

2.5 per laying pair. Few if any wild populations are known to do better.

* * *

Region 6 — The red shiner (*Notropis lutrensis*), a fish from the southern and southwestern Great Plains, recently invaded the upper Virgin River in Utah. Competition from this exotic fish is believed to be responsible for a 72-percent decline in numbers of the native Endangered woundfin minnow (*Plagopterus argentissimus*) in the recently invaded reach over the past few years. Further invasion was impeded by a diversion dam, but the possibility remained that the red shiner would get past this barrier to penetrate the last uncontaminated habitat and cause the extinction of the woundfin.

The Service, in cooperation with the Utah Division of Wildlife Resources and the Washington County Water Conservancy District, conducted a red shiner eradication project in late 1988. It was intended to protect the woundfin by reclaiming from the red shiner 21 miles of riverine habitat downstream of the diversion dam. Thousands of woundfin and a rare Virgin River chub were salvaged from the treatment area. A small diversion dam 6 miles downstream of the main diversion dam was modified to make it a better fish barrier. The buffer zone between the two diversion dams would, after chemical treatment to remove red shiners, protect the upstream woundfin population in case the other rehabilitation efforts downstream failed. A larger barrier dam then was constructed 14 miles downstream of the small barrier/diversion dam to create additional woundfin habitat after treatment. Several rotenone treatments were applied to eradicate the red shiners in this reach. Semiannual monitoring will determine whether or not these treatments were successful.

The downstream barrier construction and chemical treatments may have occurred just in time. On New Years Day, 1989, the main upstream diversion dam, which had been the only barrier to the invasion of the last uncontaminated woundfin habitat,suddenly broke. The flood waters breached the smaller diversion dam 6 miles downstream, but the larger barrier dam another 14 miles downstream held. Thus, red shiners below this barrier were prevented from passing by the breached dams upstream into the woundfin habitat.

* * *

Region 7 — *Thlaspi arcticum*, a small white-flowering member of the mustard family, has been considered a category two candidate for a listing proposal. Although it is known from numerous scattered locations in northeastern Alaska and the adjacent Yukon Territory of Canada, most colonies were known to number only a few individuals. Concern for the welfare of this candidate species increased when it appeared that the locations of the largest populations were on the North Slope of Alaska, where oil and gas development could pose a threat.

photo by Nancy Felix

A status review for* Thlaspi arcticum, *a small plant native to regions of the Arctic, revealed that this species has a much wider distribution than previously thought.

In June 1988, Nancy Felix, Janet Christiansen, Kristen DuBois, and other personnel from the Arctic National Wildlife Refuge conducted surveys in areas of the refuge not recently examined for *Thlaspi*. The results of these efforts were most encouraging. Surveys in the Arctic Refuge resulted in the discovery of several previously unknown locations for the species. Although most populations were scattered and small in number, one of them exceeded 1,000 plants. All of the populations are within the designated wilderness portion of the refuge, and thus are not likely to be affected by human activities.

Since there were taxonomic questions regarding the affinity of this species to its nearest congeners in North America and the Soviet Union, Dr. David Murray of the University of Alaska Herbarium was contracted to reevaluate its status. Dr. Murray concluded that *T. arcticum* is a valid taxon. In addition, he found that plants from the Soviet Arctic previously known as *T. cochleariforme* are the same as *T. arcticum* in Alaska and Canada. Therefore, *T. arcticum* has a much wider distribution than previously thought. As a result of the taxonomic review and the 1988 surveys, this species likely will be withdrawn from the candidate species list.

* * *

Region 8 (Research) — Studies on the Threatened greenback cutthroat trout (*Salmo clarki stomias*) by the Jackson, Wyoming, Field Research Station of the National Fisheries Contaminant Research Center-Columbia have demonstrated that this species is not as sensitive to acid rain as are Snake River and Yellowstone cutthroat trout. Four life stages were exposed to 12 combinations of acidity and dissolved aluminum in 7-day pulsed tests.

* * *

Laboratory results received in late November indicate that a radioed gray wolf (*Canis lupus*) that died in the Superior National Forest, Minnesota, during early November had symptoms of Lyme disease — a tick-borne malady.

* * *

One radioed adult female gray wolf was shot illegally in early November within Superior National Forest. This incident is being investigated by Service law enforcement agents.

* * *

Four Endangered Hispaniolan parrots (*Amazona ventralis*) were seized by Service law enforcement agents in Region 4 during November. After health testing at the Miami Metrozoo, the birds will be sent to the Luquillo aviary in Puerto Rico where they will be used as surrogate research animals for the Puerto Rican parrot (*Amazona vittata*) project.

New Endangered Species List Available

The Fish and Wildlife Service has published an updated and revised List of Endangered and Threatened Wildlife and Plants. This new list covers all listing actions completed through January 1, 1989, and supersedes all versions published previously. Copies of the list are available from the Publications Unit, U.S. Fish and Wildlife Service, Washington, D.C. 20240.

BOX SCORE OF LISTINGS AND RECOVERY PLANS

Category	ENDANGERED U.S. Only	ENDANGERED U.S. & Foreign	ENDANGERED Foreign Only	THREATENED U.S. Only	THREATENED U.S. & Foreign	THREATENED Foreign Only	SPECIES* TOTAL	SPECIES WITH PLANS
Mammals	31	19	240	5	2	23	320	24
Birds	61	15	145	7	3	0	231	57
Reptiles	8	7	59	14	4	14	106	22
Amphibians	5	0	8	4	0	0	17	5
Fishes	45	2	11	24	6	0	88	47
Snails	3	0	1	5	0	0	9	7
Clams	32	0	2	0	0	0	34	22
Crustaceans	8	0	0	1	0	0	9	4
Insects	10	0	0	7	0	0	17	12
Arachnids	3	0	0	0	0	0	3	0
Plants	151	6	1	40	6	2	206	84
TOTAL	357	49	467	107	21	39	1040	284 **

Total U.S. Endangered **406**
Total U.S. Threatened **128**
Total U.S. Listed **534**

Recovery Plans approved: 242

*Separate populations of a species that are listed both as Endangered and Threatened are tallied twice. Those species are the leopard, gray wolf, grizzly bear, bald eagle, piping plover, roseate tern, Nile crocodile, green sea turtle, and olive ridley sea turtle. For the purposes of the Endangered Species Act, the term "species" can mean a species, subspecies, or distinct vertebrate population. Several entries also represent entire genera or even families.

**More than one species are covered by some recovery plans, and a few species have separate plans covering different parts of their ranges.

Number of Cooperative Agreements signed with States and Territories: 51 fish & wildlife
March 1, 1989 36 plants

January/February 1989 Vol. XIV Nos. 1–2

ENDANGERED SPECIES

Technical Bulletin

Department of the Interior, U.S. Fish and Wildlife Service, Washington, D.C. 20240